Mitigation of Nitrous Oxide Emissions from a Maize Crop in Western Burkina Faso (West Africa) by Comparing Different Fertilizers

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The application of nitrogen (N) fertilizers to agricultural soils is a primary source of nitrous oxide (N_2O) emissions to the atmosphere. Improving fertilizer management is identified as a potential mitigation option for N_2O emissions. However, few studies are poorly investigated, limiting mitigation actions and climate-smart agriculture promotion. The objective of this study was to assess the effect of different fertilizers on soil N_2O emissions and other parameters associated with N fertilizers; and develop N_2O emission factor (EF) to improve the national greenhouse gas inventory. To achieve this, four (04) fertilization treatments: Mixture (manure + chemical fertilizer), local traditional fertilization, NPK, cattle manure, and control treatment were investigated under a randomized complete block design using static chamber and gas chromatography systems based in Burkina Faso. Results indicated that mixture fertilization including chemical fertilizer recorded the highest and most significant (P<0.01) cumulative N_2O emissions (2.86 ± 00.7 Kg N_2O-N ha-1 season-1) while the manure application recorded the lowest N_2O emissions (2.38 ± 0.03 Kg N_2O-N ha-1 season-1). N_2O EF from cattle manure ($1.67 \pm 0.6\%$) was found to be lower than that from only chemical fertilizer ($1.90 \pm 0.4\%$). Results showed that N rate had a significant (P<0.001) effect on soil N_2O emissions, with a linear positive response ($R^2 = 0.77$) on cumulative N_2O. However, when organic manure was applied, the impact of CH_4 and N_2O emissions on Global Warming Potential was significantly (P<0.01) enhanced (652.78 ± 15 kg CO_2 eq. ha-1 Season-1) with the lowest value. Our results suggest that the application of cattle manure can be promoted because it slightly reduces N_2O emissions. This study contributes to more robust estimates of greenhouse gas emissions from African farmland systems, which are fundamental to updating NDCs and developing targeted mitigation strategies..

Biography

Christian BOUGMA is PhD student in the Laboratory of Plant Biology and Ecology, University Joseph Ki-Zerbo, Ouagadougou, Burkina Faso (West Africa). He currently assesses Greenhouse Gas emissions under different crop systems to implement Climate Smart Agriculture in West Africa and propose mitigation actions to policymakers and farmers to reduce GHG emissions. He was a member of the drafting committee for Burkina Faso's National Climate Change Adaptation Plan (2024-2028). Currently assessing the modeling and mitigation of GHG emissions from rice cultivation using agronomic strategies at University of Agriculture, Faisalabad / Pakistan, He focuses her research on Agricultural greenhouse gas mitigation and emissions due to land use change through a multidisciplinary research team composed by expert which Prof. Dr. Oumarou OUEDRAOGO is the lead.

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